

Name: \_\_\_\_\_ Date: \_\_\_\_\_ MYP Level 4: Algebra I

## Lesson 18 Equations Involving a Variable Expression in the Denominator

Learning Outcome: **I CAN** find the solution sets for equations with a variable in the denominator, as well as exclude invalid values from the solution set.

### Opening Exercise

Nolan says that he checks the answer to a division problem by performing multiplication. For example, he says that  $20 \div 4 = 5$  is correct because  $5 \times 4$  is 20, and  $\frac{3}{1/2} = 6$  is correct because  $6 \times \frac{1}{2}$  is 3.

a. Using Nolan's reasoning explain why there is no real number that is the answer to the division problem  $5 \div 0$ .

b. Quentin says that  $\frac{0}{0} = 17$ . What do you think?

c. Mavis says that the expression  $\frac{5}{x+2}$  has a meaningful value for whatever value one chooses to assign to  $x$ . Do you agree?

d. Bernoit says that the expression  $\frac{3x-6}{x-2}$  always has the value 3 for whichever value one assigns to  $x$ . Do you agree?

## Exercises 1-2

1. Rewrite  $\frac{10}{x+5}$  as a compound statement.

2. Consider  $\frac{x^2-25}{(x^2-9)(x+4)}$ .

a. Is it permissible to let  $x = 5$  in this expression?

b. Is it permissible to let  $x = 3$  in this expression?

c. Give all the values of  $x$  that are *not* permissible in this expression.

### Example 1

Consider the equation  $\frac{1}{2x} = \frac{3}{x-5}$ .

a. Rewrite the equation into a compound statement.

b. Solve the equation for  $x$ , excluding the value(s) of  $x$  that lead to a denominator of zero.

## Example 2

Consider the equation  $\frac{x+3}{x-2} = \frac{5}{x-2}$ .

- a. Rewrite the equation into a compound statement.
  
  
  
  
  
  
  
  
  
  
- b. Solve the equation for  $x$ , excluding the value(s) of  $x$  that lead to a denominator of zero.

## Exercises 3-8

Rewrite each equation into a compound statement, excluding the value(s) of  $x$  that lead to a denominator of zero; then, solve the equation for  $x$ .

3.  $\frac{5}{x} = 1$

4.  $\frac{1}{x-5} = 3$

5.  $\frac{x}{x+1} = 4$

6.  $\frac{2}{x} = \frac{3}{x-4}$

7.  $\frac{x}{x+6} = -\frac{6}{x+6}$

8.  $\frac{x-3}{x+2} = 0$

## Lesson 18 CW/HW

1. Consider the equation  $\frac{10(x^2-49)}{3x(x+1)} = 0$ . Is  $x = 7$  permissible? Which values of  $x$  are excluded? Rewrite as a compound statement.
2. Rewrite each equation into compound statements excluding the value(s) of  $x$  that lead to a denominator of zero. Then solve the equation for  $x$ .
  - a.  $25x = \frac{1}{x}$
  - b.  $\frac{1}{5x} = 10$
  - c.  $\frac{x}{7-x} = 2x$
  - d.  $\frac{2}{x} = \frac{5}{x+1}$
  - e.  $\frac{3+x}{3-x} = \frac{3+2x}{3-2x}$
3. Write an equation with the restrictions  $x \neq 14$ ,  $x \neq 2$ , and  $x \neq 0$ .
4. Write an equation that has no solution.